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### (54) Method for suppressing grassy smell and acid taste of vegetables and fruits

Verfahren zur Unterdrückung des grasartigen Geruchs und des Sauergeschmacks von Gemüse und Früchten

Procédé pour masquer l'odeur herbeuse et le goût acide de légumes et fruits

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## Description

[0001] The present invention relates to a method of suppressing or masking the grassy smell and acid taste of vegetables and fruits. More particularly, the present invention relates to a method of effectively suppressing or masking the grassy smell and acid taste characteristic of vegetables and fruits in the production of food and drink from vegetables and fruits having a strong grassy smell or acid taste, thereby making such food and drink palatable.

[0002] Because of their high content of vitamins, minerals, and dietary fiber, such vegetables as carrot, tomato, celery, and cabbage and such fruits as mandarin orange, apple, grapefruit, and lemon have recently come to be consumed in large quantities in the form of juice, puree, or soup in response to the recent change in eating habits seeking for health and to the reflection on highly processed eating habits. Unfortunately, these foods and drinks are usually hard to be eaten or drunk. It is generally due to characteristic taste and smell of vegetables such as grassy smell and taste and due to those of fruits such as acid taste, bitter taste and grassy smell.

[0003] One conventional means to address this problem was to add a spice to vegetable juice. However, the spice adversely affects the flavor but does not always suppress the grassy smell of vegetable. There has been proposed a method for masking the grassy smell of vegetable juice by adding methyl ester of  $\alpha$ -L-aspartyl-L-phenylalanine (in JP-A-59-11156(1984)) or by adding glycine and/or alanine (in JP-A-62-40258(1987)). These methods, however, were not necessarily satisfactory from the standpoint of suppressing the grassy smell.

[0004] The present invention was completed to address the above-mentioned problem involved in the conventional technology. Accordingly, it is an object of the present invention to provide a method of effectively suppressing or masking the grassy smell and acid taste characteristic of vegetables and fruits in the production of food and drink from vegetables and fruits having a strong grassy smell or acid taste, thereby making such food and drink palatable. It is another object of the present invention to provide a method of improving the flavor of food and drink produced from vegetables and fruits having a strong grassy smell and acid taste.

[0005] These objects have been achieved by the surprising finding that it is possible to suppress or mask the grassy smell and acid taste of vegetables and fruits, thereby improving the flavor of food and drink made therefrom, by adding to them erythritol which is one species of sugar alcohols.

[0006] The gist of the present invention resides in a method of suppressing the grassy smell and acid taste characteristic of vegetables and fruits in the production of food and drink from vegetables and fruits having a strong grassy smell and acid taste, said method comprising adding erythritol in an amount of 0.2 to 3.0 wt% of the weight of the product.

[0007] As to food and drink made from vegetables and fruits with strong grassy smell and acid taste, the present invention may be suitably applied to food and drink produced especially from the following vegetables for which it is necessary to suppress or mask their grassy smell: tomato, celery, cabbage, aloe, cornfree, moroheiya, spinach, bean sprout, cucumber, garland chrysanthemum, pumpkin, green pepper, lettuce, sunny lettuce, pulse such as green peas and broad bean and roots such as carrot, radish, edible burdock, etc.; and the following fruits for which it is necessary to suppress or mask their acid taste: citrus fruits such as mandarin orange (Unshu mandarine orange), summer orange, Hassaku (citrus hassaku), lime, grapefruit, lemon, etc., grape, melon, oriental melon, watermelon, apple, peach for canning, etc., and especially citrus fruits are applicable.

[0008] The present invention may be applied to food and drink of any type, typically in the form of juice, puree, and soup produced from vegetables, or in the form of juice, puree, nectar, and cans produced from fruits (especially juice). Juice may include "mixed juice" of vegetables and fruits (mixed drink with fruit juice).

[0009] The food and drink to which the present invention may be applied may be any food and drink made from and composed mainly of vegetables and fruits and may contain ancillary materials and additives which are commonly used in the food industry.

[0010] The present invention will be useful particularly for removing the grassy smell from tomato juice and carrot juice (or mixed juice with fruit juice) which are expected to have an increasing demand. The present invention may also be effective in removing the grassy smell from green vegetable juice etc. and suppressing the acid taste and bitter taste of citrus fruits such as grapefruit and mandarin orange.

[0011] According to the present invention, erythritol is added to food and drink during their production from the above-mentioned vegetables and fruits having a strong grassy smell and acid taste.

[0012] Erythritol used in the present invention is a saccharide having four consecutive carbons which exists naturally and is contained in fungi, fruits (such as melon), and fermented foods (such as Mirin (sweet sake), soy sauce, and wine). It is a known sugar alcohol in the form of colorless, transparent crystal having a melting point of 119°C and a molecular weight of 122. It has a sweetness equivalent to 75% of that of sucrose. It has good heat resistance, acid resistance, and alkali resistance and is chemically stable. It is physiologically characterized by non-cariogenicity, non-caloric value, and non-insulin dependence.

[0013] Erythritol is commercially available in the form of crystalline powder, and any commercial product can be used in the present invention. A commercial product may resemble granulated sugar in appearance (grain size) or may be in the form of fine powder. Both may be used as such in the present invention. An example is one which is available

from Nikken Chemicals Co., Ltd. It is known as a sweetener but nothing is known about the fact that it can suppress or mask the grassy smell and acid taste.

[0014] According to the present invention, the above-mentioned erythritol is added in an amount of 0.2-3.0 wt%, preferably 0.8-2.0 wt%, of the weight of the product in the production of food and drink from vegetables and fruits having a strong grassy smell and acid taste. The optimum amount of erythritol varies depending on the form and raw materials of the food and drink to which it is added. Usually an amount of 0.2-1.0 wt% will be enough to suppress the grassy smell, acid taste, acrid taste, and bitter taste regardless of the form and raw material (vegetable or fruit) of the food and drink without causing the food and drink to taste sweetness of erythritol. With an amount in excess of 1.0 wt% (but less than 3.0 wt%), erythritol apparently adds to sweetness, more softens acid taste and bitter taste and makes the food and drink to taste milder.

[0015] According to the present invention, a noticeable effect on improvement of flavor like grassy smell, acid taste, etc. is produced when the amount of erythritol is in the range of 0.2 to 3.0 wt%. With an amount less than 0.2 wt%, erythritol does not produce a noticeable effect; with an amount in excess of 3.0 wt%, erythritol adds to sweetness to so such an extent that the natural taste of vegetable and fruits themselves are lost although it suppresses the grassy smell and acid taste. Either case is not preferable.

[0016] As mentioned above, erythritol is thermally stable and unreactive to effective components contained in vegetables and fruits such as vitamins and amino acids. Consequently, there are no restrictions on how to and when to add erythritol to food and drink. It is only important to employ a method which ensures the uniform distribution of erythritol in food and drink.

[0017] Incidentally, if necessary, it is possible to use erythritol in combination with any known masking material or spice in an amount not harmful to the effect of the present invention.

[0018] The present invention as mentioned above effectively suppresses the grassy smell and acid taste characteristic of vegetable and fruits and hence makes vegetable juice and mandarin orange juice palatable for those who dislike them because of their grassy smell, acid taste and bitter taste, and makes them highly suite anyone's taste.

[0019] To further illustrate this invention the following examples are given.

#### Example 1:

[0020] Erythritol (from Nikken Chemicals Co., Ltd.) was added in different amounts to salt-free 100% tomato juice. With erythritol completely dissolved, the resulting samples were compared with control in a sensory test by 8 panelists. The results are shown in Table 1.

Table 1

		Amount added (wt%)							
		0.2	0.5	0.8	1.0	2.0	2.5	3.0	3.5
Grassy smell	Strong								
	No change	2	1	1					
	Weak	6	5	2	3	1			
	None		2	5	5	7	8	8	8
Taste	Unpalatable								
	No change	3	1	1					
	Palatable	5	7	6	5	4	2	1	
	Like sweet juice			1	2	3	4	5	2
	Too sweet				1	1	2	2	6

[0021] It is noted from Table 1 that erythritol added in an amount more than 0.2 wt% suppresses the grassy smell of tomato juice and that erythritol added in an amount of 3.5 wt% makes the tomato juice too sweet. It is apparent that an amount in the range of 0.8 to 2.0 wt% is just enough to suppress the grassy smell of tomato juice almost completely and even to improve the taste of tomato juice.

#### Example 2:

[0022] Erythritol (from Nikken Chemicals Co., Ltd.) was added in different amounts to 100% carrot juice. With eryth-

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ritol completely dissolved, the resulting samples were compared with control in a sensory test by 8 panelists. The results are shown in Table 2.

Table 2

		Amount added (wt%)							
		0.2	0.5	0.8	1.0	2.0	2.5	3.0	3.5
Grassy smell	Strong								
	No change	1	1						
	Weak	7	4	2	1				
	None		3	6	7	8	8	8	8
Taste	Unpalatable								
	No change	2	1	1					
	Palatable	6	7	7	4	3	2	1	1
	Like sweet juice				3	4	5	5	2
	Too sweet				1	1	1	2	5

[0023] It is noted from Table 2 that erythritol added in an amount more than 0.2 wt% suppresses the grassy smell of carrot juice and that erythritol added in an amount of 3.5 wt% makes the carrot juice too sweet. It is apparent that an amount in the range of 0.8 to 2.0 wt% is just enough to suppress the grassy smell of carrot juice almost completely and even to improve the taste of carrot juice.

Example 3:

[0024] A test sample was prepared by adding erythritol in an amount of 0.5 wt% to 100% carrot juice. A comparative sample was prepared by adding sucrose in an amount of 0.375 wt% to 100% carrot juice. (Sucrose is added to make the latter sample as sweet as the former sample.) The effect of erythritol and sucrose was examined by comparing each sample with control (nothing is added) in a pair test by 16 panelists. The results are shown in Table 3 (comparison with erythritol with control) and Table 4 (comparison with sucrose with control).

Table 3

	Control	Sample with erythritol
Grassy smell	14	2
Palatable	2	14
General evaluation	2	14

Table 4

	Control	Sample with sucrose
Grassy smell	9	7
Palatable	8	8
General evaluation	8	8

[0025] It is noted from Tables 3 and 4 that control apparently has a remaining grassy smell and that the erythritol-containing sample is more palatable and more preferable in general than the sucrose-containing sample.

Example 4:

[0026] Test samples were prepared by adding erythritol in an amount of 0.5 wt%, 1.0 wt%, and 2.0 wt% to a drink composed of 20 wt% vegetable juice (of moroheiya and spinach, etc.) and 80 wt% fruit juice (of apple, muscat, and

grapefruit, etc.). The samples were compared with control (nothing is added) in a sensory test by 8 panelists. The results are shown in Table 5.

Table 5

Amount of erythritol	Degree of grassy smell	Taste
0.5 wt%	Weak	Plain, without aftertaste
1.0 wt%	None	Slightly sweet, mild
2.0 wt%	None	Slightly sweet, mild

Example 5:

[0027] A test sample was prepared by adding erythritol in an amount of 0.5 wt% to 100% carrot juice. A comparative sample was prepared by adding glycine in an amount of 0.5 wt% to 100% carrot juice (according to Japanese Patent Laid-open No. 40258/1987). The effect of suppressing a grassy smell was examined in a pair test by 15 panelists. The results are shown in Table 6. It is apparent that a grassy smell remained more in the glycine-containing sample than in the erythritol-containing sample.

Table 6

Evaluation	No. of panelists
Panelists who felt that the erythritol-containing sample had a stronger grassy smell	4
Panelists who felt that the glycine-containing sample had a stronger grassy smell	9
Panelists who felt that both sample had a stronger grassy smell at the same level	2

Example 6:

[0028] A test sample was prepared by adding erythritol in an amount of 1.5 wt% to 100% carrot juice. A comparative sample was prepared by adding aspartame (methyl ester of  $\alpha$ -L-aspartyl-L-phenylalanine) in an amount of 0.001 wt% to 100% carrot juice (according to Japanese Patent Laid-open No. 11156/1984). The effect of suppressing a grassy smell was examined in a pair test by 15 panelists. The results are shown in Table 7. It is apparent that a grassy smell remained more in the aspartame-containing sample than in the erythritol-containing sample.

Table 7

Evaluation	No. of panelists
Panelists who felt that the erythritol-containing sample had a stronger grassy smell	4
Panelists who felt that the aspartame-containing sample had a stronger grassy smell	11
Panelists who felt that both sample had a stronger grassy smell at the same level	0

Example 7:

[0029] A test sample was prepared by adding erythritol in an amount of 1.0 wt% to 100 % mandarin orange juice (Unshu mandarin orange juice). A comparative sample was prepared by adding sucrose in an amount of 0.75 wt% to 100 % mandarin orange juice. (Sucrose is added to make the latter sample as sweet as the former sample.) The effect of erythritol and sucrose was examined by comparing each sample with control (nothing is added) in a pair test by 16 panelists. The results are shown in Table 8 (comparison with erythritol with control) and Table 9 (comparison with sucrose with control).

Table 8

	Control	Sample with erythritol
Strong acid taste	15	1
Palatable	3	13
General evaluation	3	13

Table 9

	Control	Sample with sucrose
Strong acid taste	10	6
Palatable	7	9
General evaluation	8	8

[0030] It is noted from Tables 8 and 9 that control apparently has a strong acid taste and that the erythritol-containing sample is more palatable and more preferable in general than the sucrose-containing sample.

Example 8:

[0031] A test sample was prepared by adding erythritol to 20% grapefruit juice of the composition shown in Table 10. A comparative sample was prepared by adding to the grapefruit juice isomerized sugar in an amount sufficient to make the latter sample as sweet as the former sample. The effect of erythritol and isomerized sugar was examined in a pair test by 16 panelists. The results are shown in Table 11.

Table 10

	Comparative sample without erythritol	Test sample with erythritol
Grapefruit juice, 1/6 concentrated (g)	33.3	33.3
Sucrose (g)	7	7
Isomerized sugar, 75% (g)	113.3	86.7
Erythritol (g)	0	20
Citric acid (g)	2	2
Grapefruit flavor (g)	1	1
Water (g)	843.4	850
Total (g)	1000	1000

Table 11

	Comparative sample without erythritol	Test sample with erythritol
Strong bitter taste	12	4
Strong acid taste	14	2
Palatable	1	15
General evaluation	3	13

[0032] It is noted from Table 11 that the test sample with erythritol has a weaker bitter taste and acid taste and is more palatable and more preferable in general than the comparative sample without erythritol.

[0033] The present invention provides a method of suppressing and masking the grassy smell and acid taste characteristic of vegetables and fruits, thereby making food and drink more palatable, by adding erythritol to food and drink in their production from vegetables and fruits having a strong grassy smell and acid taste. The thus added erythritol also improves the taste of food and drink without adversely affecting the natural taste of vegetables and fruits and without increasing their sweetness. In addition, since erythritol added has non-calorific value, there is no fear of deteriorating food and drink for health.

#### Claims

1. A method of suppressing the smell and taste characteristics of vegetables and fruits in the production of food and drinks from vegetables and fruits, said method comprising adding erythritol in an amount of 0.2 to 3.0 wt% of the

weight of the product.

2. The method according to claim 1 wherein the grassy smell and acid taste characteristics of vegetables and fruits in the production of food and drinks from vegetables and fruits having a strong grassy smell and acid taste is suppressed.
3. The method according to claim 1 wherein the grassy smell characteristics of vegetables in the production of food and drink from vegetables having a strong grassy smell is suppressed.
4. The method as defined in claim 3, wherein the food and drink made from vegetables is juice, puree, or soup.
5. The method as defined in claim 3, wherein the food and drink made from vegetables is tomato juice, carrot juice, or mixed juice containing fruit juice.
6. The method according to claim 1 wherein the acid taste characteristics of fruits in the production of food and drink from fruits having a strong acid taste is suppressed.
7. The method as defined in claim 6, wherein the food and drink made from fruits is juice produced from citrus fruits.
8. Use of erythritol in an amount of 0.2 to 3.0 wt% for suppressing the grassy smell and/or acid taste characteristics of vegetables and fruits.

#### Patentansprüche

1. Verfahren zur Unterdrückung der charakteristischen Geruchs- und Geschmacksmerkmale von Gemüse und Früchten bei der Herstellung von Nahrungsmitteln und Getränken aus Gemüse und Früchten, wobei das Verfahren die Zugabe von Erythrit in einer Menge von 0,2 bis 3,0 Gew.% bezogen auf das Gewicht des Erzeugnisses umfasst.
2. Verfahren nach Anspruch 1, wobei die charakteristischen grasartigen Geruchs- und die charakteristischen sauren Geschmacksmerkmale von Gemüse und Früchten bei der Herstellung von Nahrungsmitteln und Getränken aus Gemüse und Früchten mit einem starken grasartigen Geruch und einem sauren Geschmack unterdrückt werden.
3. Verfahren nach Anspruch 1, wobei die charakteristischen grasartigen Geruchsmerkmale von Gemüse bei der Herstellung von Nahrungsmitteln und Getränken aus Gemüse mit einem starken grasartigen Geruch unterdrückt werden.
4. Verfahren nach Anspruch 3, wobei das Nahrungsmittel und Getränk, das aus Gemüse hergestellt wird, Saft, Püree oder Suppe ist.
5. Verfahren nach Anspruch 3, wobei das Nahrungsmittel und Getränk, das aus Gemüse hergestellt wird, Tomatensaft, Karottensaft oder Mischsäfte, die Fruchtsaft enthalten, ist.
6. Verfahren nach Anspruch 1, wobei die charakteristischen sauren Geschmacksmerkmale von Früchten bei der Herstellung von Nahrungsmitteln und Getränken aus Früchten mit einem starken sauren Geschmack unterdrückt werden.
7. Verfahren nach Anspruch 6, wobei das Nahrungsmittel und Getränk, das aus Früchten hergestellt wird, ein Saft ist, der aus Zitrusfrüchten hergestellt wird.
8. Verwendung von Erythrit in einer Menge von 0,2 bis 3,0 Gew.% zur Unterdrückung der charakteristischen grasartigen Geruchs- und/oder der charakteristischen sauren Geschmacksmerkmale von Gemüse und Früchten.

#### Revendications

1. Procédé pour supprimer l'odeur et le goût caractéristiques de légumes et de fruits dans la production d'aliments et de boissons à partir de légumes et de fruits, ledit procédé comprenant l'addition d'érythritol en une quantité de

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0,2 à 3,0 % en poids par rapport au poids du produit.

2. Procédé selon la revendication 1, dans lequel l'odeur d'herbe et le goût acide caractéristiques d légumes et de fruits dans la production d'aliments et de boissons à partir de légumes et de fruits ayant une forte odeur d'herbe et un fort goût acide sont supprimés.
3. Procédé selon la revendication 1, dans lequel l'odeur d'herbe caractéristique de légumes dans la production d'aliments et de boissons à partir de légumes ayant une forte odeur d'herbe est supprimée.
4. Procédé selon la revendication 3, dans lequel l'aliment ou la boisson préparé à partir de légumes est un jus, une purée ou une soupe.
5. Procédé selon la revendication 3, dans lequel l'aliment ou la boisson préparé à partir de légumes est un jus de tomate, un jus de carotte ou un mélange de jus contenant du jus de fruit.
6. Procédé selon la revendication 1, dans lequel le goût acide caractéristique de fruits dans la production d'aliments et de boissons à partir de fruits ayant un fort goût acide est supprimé.
7. Procédé selon la revendication 6, dans lequel l'aliment ou la boisson préparé à partir de fruits est un jus produit à partir d'agrumes.
8. Utilisation d'érythritol en une quantité de 0,2 à 3,0 % en poids pour supprimer l'odeur d'herbe et/ou le goût acide caractéristiques de légumes et de fruits.